

GENERAL LIBRARY
MAY - 6 1920
UNIVERSITY OF MICHIGAN

SCIENCE

NEW SERIES
VOL. LI, No. 1322

FRIDAY, APRIL 30, 1920

SINGLE COPIES, 15 CTS.
ANNUAL SUBSCRIPTION, \$6.00

For Better Health

Head's Mouth Hygiene

Everyday Mouth Hygiene. By JOSEPH HEAD, M.D., D.D.S. 12mo of 65 pages, illustrated. Cloth, \$1.00 net.

Receding gums, heart troubles, stomach troubles, rheumatism, diseased tonsils, are some of the results of decayed teeth. Keeping the teeth well is the forte of this work.

Bandler's Expectant Mother

The Expectant Mother. By S. WYLLIS BANDLER, M.D. 12mo of 213 pages, illustrated. \$1.25 net.

This book aims to insure the health of the mother and child. It tells the prospective mother just what she wants to know in clear, clean language. It is decidedly a book for every woman preparing for childbirth.

Griffith's Care of the Baby

Care of the Baby. By J. P. CROZER GRIFFITH, M.D. 12mo of 455 pages, illustrated. Cloth, \$1.50 net.

Dr. Griffith shares with you his intimate and intelligent knowledge of the medical and hygienic sides of childhood. You get everything you want to know about baby care—illustrated.

Abt's The Baby's Food

The Baby's Food. By ISAAC A. ABT, M.D. 12mo of 143 pages. Cloth, \$1.25 net.

The health of a baby is more intimately dependent upon the food supply than upon any other single factor. This book tells the mother precisely how to prepare the food as your doctor wishes it prepared.

Galbraith's Hygiene for Women

Hygiene and Physical Exercise for Women. By ANNA M. GALBRAITH, M.D. 12mo of 393 pages. Cloth, \$2.25 net.

Bathing, proper food and clothing, gymnastics, hydrotherapy, care of skin, hair, hands, feet, development of form, carriage—and such other information making for efficiency.

Pyle's Personal Hygiene

Personal Hygiene. By WALTER L. PYLE, M.D. 12mo of 555 pages, illustrated. Cloth, \$1.75 net.

To achieve success in life there is one factor of prime importance—Health, good red blood! Dr. Pyle's work contains just the information that will lead you to good health—and keep you well.

Brady's Personal Health

Personal Health. By WILLIAM BRADY, M.D. 12mo of 407 pages. Cloth, \$1.50 net.

Do you know how to take care of yourself—how to forestall illness, how to live longer? Dr. Brady gives you a clear idea of the causes of ill health and prescribes simple treatments when these are sufficient.

Stokes' Third Great Plague

The Third Great Plague. By JOHN H. STOKES, M.D. 12mo of 204 pages. Cloth, \$2.25 net.

Public education has practically eradicated tuberculosis, yellow fever, and malaria. The third great plague (syphilis) is preventable, and Dr. Stokes aims to do this by *corrective* instruction.

At Leading Bookstores or

W. B. SAUNDERS COMPANY

Philadelphia and London



BACTO-PEPTONE

Difco Standardized

The Original Standardized Peptone for Bacteriology

Bacto Peptone is the original peptone designed to meet particularly the nutritional requirements of bacteria in culture.

It is the first peptone designed to meet the requirement of uniformity in its chemical and biological properties.

It is made in large quantities by expert workmen under rigid scientific check and control. Raw materials are approved only after assay. Accurate records of each lot are kept throughout the manufacturing process, and only those lots which pass definite chemical and bacteriological tests are allowed to go into stock for distribution.

A definite requirement as to the H-ion concentration in solution was applied first to Bacto-Peptone.

It is standardized as to its Tryptophane content and supports vigorous Indol production within 24 hours after inoculation.

Bacto Peptone has passed the experimental stages and has proved its absolute dependability for all nutritional requirements of Bacteriology.

Bacto-Peptone Stands on its own Merits and Completely Substantiates all Claims made for it.

The additional equipment which we were forced to install in order to furnish the unprecedented quantities of Bacto-Peptone requisitioned for the U. S. and allied military establishments enables us to take care of all orders, irrespective of size, promptly and uniformly.

Carried in stock by the principal dealers in Scientific Supplies

DIGESTIVE FERMENTS COMPANY

DETROIT, MICHIGAN, U. S. A.

SCIENCE

FRIDAY, APRIL 30, 1920

CONTENTS

<i>Inventions and Patents</i> : DR. ANDREW STEWART	421
<i>The Use and Abuse of the Genus</i> : DR. WITMER STONE	427
<i>Oscar A. Randolph</i> : O. C. LESTER	429
<i>Alfred J. Moses</i> : H. P. W.	429
<i>Scientific Events</i> :—	
<i>Investigations in Polynesia; The Pan-Pacific Scientific Congress; Appropriations for the New York State College of Agriculture; Selenium and Tellurium; Physical and Chemical Constants</i>	430
<i>Scientific Notes and News</i>	433
<i>University and Educational News</i>	435
<i>Discussion and Correspondence</i> :—	
<i>Unification of Symbols and Diagrams</i> : DR. WALTER P. WHITE. <i>Carbon Monoxide</i> : W. M. <i>The Attainment of High Levels in the Atmosphere</i> : PROFESSOR ALEXANDER MCADIE	436
<i>Scientific Books</i> :—	
<i>McCoy and Terry's Introduction to General Chemistry</i> : PROFESSOR JAMES F. NORRIS....	438
<i>Notes on Meteorology and Climatology</i> :—	
<i>Rainfall Interception by Trees and Crops; Atmospheric Moisture in the United States</i> : DR. CHARLES F. BROOKS	439
<i>Special Articles</i> :—	
<i>Limits of the Genera Vandellia and Urinophilus</i> : PROFESSOR C. H. EIGENMANN	441
<i>The American Association for the Advancement of Science</i> :—	
<i>Section H—Anthropology and Psychology</i> : PROFESSOR EDWARD K. STRONG, JR.	441
<i>General Meeting of the American Chemical Society</i> : CHAS. L. PARSONS	444

MSS. intended for publication and books, etc., intended for review should be sent to The Editor of Science, Garrison-on-Hudson, N. Y.

INVENTIONS AND PATENTS

THE status of the inventor within the government service, of his invention and the administration and utilization of the same, presents a problem that has been growing increasingly acute during the last decade.

The pressing need for some one government agency to undertake, under a unified, comprehensive system, the administration and industrial development of patentable inventions and patents originating in the government bureaus was formulated by Dr. F. G. Cottrell, of the Bureau of Mines, in a paper, entitled "Government Owned Patents," presented to the American Mining Congress, in November, 1916.

Dr. Cottrell was brought to the full realization of the highly unsatisfactory situation of the government inventor through his experience with some patents of his own. It was his desire to make the public the sole beneficiary of these, but for reasons which will appear below, there was no practicable way of accomplishing this. Donation to the government was not feasible because there was no government official or agency authorized by law to accept assignment of patents; so he finally conceived and brought into existence a non-dividend paying corporation,¹ and to this assigned his patents for administration and license. A fundamental stipulation in its certificate of incorporation was that the profits, over and above actual running expenses, should be used for the advancement of research, and thus a public double benefit was effected.

This new departure in economics has been in successful operation for several years and the achievement has pointed the way for and has justified the attempt to try out an experiment along similar lines in the government service; and this has culminated in a bill

¹ Research Corporation, New York.

which has been introduced in Congress and which provides as follows:

S. 3223 & H. R. 9932.

A BILL authorizing the Federal Trade Commission to accept and administer for the benefit of the public and the encouragement of industry, inventions, patents, and patent rights, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Federal Trade Commission be, and hereby is, authorized and empowered to accept assignment of, or license or other rights or powers under, to develop, to issue or refuse to issue licenses under, to encourage the industrial use and application of, and otherwise to administer, on behalf of the United States, under such regulations and in such manner as the President shall prescribe, inventions, patents, and patent rights which said commission deems it to the advantage of the public to be so accepted, as these may from time to time be tendered it by employees of the various departments or other establishments of the government, or by other individuals or agencies; and to cooperate, as necessity may arise, with scientific or other agencies of the government in the discharge of the duties herein set out.

Sec. 2. That the Federal Trade Commission be, and is hereby, authorized and empowered to collect fees and royalties for licensing said inventions, patents, and patent rights in such amounts and in such manner as the President shall direct, and shall deposit the same with the Treasurer of the United States; and of the total amount of such fees and royalties so deposited a certain per centum, to be determined by the President, shall be reserved, set aside, and appropriated as a special fund to be disbursed as directed by the President to remunerate inventors for such of their inventions, patents, and patent rights contemplated by this Act as may prove meritorious and of public benefit.

Sec. 3. That the Commissioner of Patents is hereby directed to grant all patents and record all assignments and licenses contemplated by this Act without the payment of any fee.

As is well known, the government has for years been fostering and developing scientific research among its workers, and this phase of its activities has reached a very advanced state of efficiency and productiveness, as exemplified, for instance, by progressive improvements in the machines and methods of husbandry re-

sulting from the labors of the Department of Agriculture; by the safety appliances and highly developed technical devices used in our mines; by the advancement in the methods and processes of metallurgy, and by the ever-increasing volume of chemical and other exact scientific discoveries issuing from the government laboratories.

But many valuable contributions to knowledge and a whole mass of scientific facts and principles developed in the course of the numerous and varied investigations carried on by the government have failed to reach and benefit the general public, because of a lack of the means of translating them into actual, practical service. There has always been an obstruction in the way of making them adequately and fully available to industry, because there has heretofore been no administrative machinery for exercising this function.

Various views have been held by government officials concerning the legal status of patents and patentable inventions developed by government employees in the course or as a result of their regular duties. In the process of litigation in patent cases certain doctrines of law have been laid down in court decisions with regard to shop right, implied license, etc., but these have not been uniformly understood or applied in the government service. It is a fact, however, that the law in regard to the ownership of patents by government employees (excepting employees of the Patent Office) is exactly the same as it is for the employees of private individuals or corporations.

A wide range of policy and point of view has existed among the departments and even among the different bureaus of the government as to whether the inventor in government service should be compelled to donate his invention to the government, with or without first patenting it, or whether he should donate it at all; whether in the first event he should receive any compensation therefor, or not, and whether he has the right to develop his patent himself, or to sell it to another; and questions of ethics in this connection have frequently arisen. Such considerations as these have been dealt with piecemeal, arbitrarily, and

often very incidentally and with some specific and immediate need in mind.

Thus, in certain bureaus of the service employees are required to dedicate their inventions or patents to the government outright, even in the absence of legal authority for the procedure; in others they are prohibited from taking out patents at all; in others, if they take them out, they must dedicate them to the public; in others, again, the employee may retain title to the patent and make what profit he can with it in the open market, but the government reserves the right of free license thereunder. In some cases this free license is restricted only to the bureau in which the invention originated, the patentee being at liberty to profit individually from the use of his invention by other branches of the service.

Then, again, in the same division, or bureau, the requirements on the individual will vary according to the nature of the service for which he was specifically employed and the character of the invention, *i. e.*, whether the invention was evolved in the course or as a result of his regular duties, or not. These illustrations represent merely a few of the many questions arising with regard to the existing relation between the government and its employees in the matter of inventions and patents.

If the employee dedicates his invention to the government it can not fully benefit the public, because, as has been stated, there is no existing instrumentality for translating inventions protected under government-owned patents into practical, industrial service, and they become practically a waste product.

If a patent be dedicated to the public unconditionally, the public is generally the loser, as has been indicated above, because protection to the capital required to exploit the patent is lacking, and because a patent so dedicated, though possibly pioneer and fundamental may be in such a form that a subsequent patent taken out by another, less generous inventor on an improvement practically essential to its effective application may operate to exclude its free public use.

Also, in this contingency, its successful use by the government, itself, is prevented, unless the government assents to whatever conditions the owner of the improvement may impose. If for any reason this should be deemed inadvisable, the government can, of course, use the improved invention without express license, just as it can use any other patented invention, as provided by Special Act of Congress, June 25, 1910, Stat. 851. But the situation thereby created is unsatisfactory, because such action entails litigation before the Court of Claims to determine a reasonable compensation to the patentee, in addition to which the approval of Congress by special enactment must be had before the compensation can be awarded. This is a formidable, costly and tedious business, both for the government and the plaintiff, and besides, works particular hardship and loss to the latter. Indeed, unless the compensation involved should be large it would probably be consumed in the process of securing it.

The tendency of the generally unsatisfactory situation here outlined has been to discourage inventiveness among government workers, and the considerations enumerated call loudly for some settled, definite and equitable disposition of this involved matter, particularly in view of the enormously increased activities and needs of the government and the business world brought about by the demands of the present war, and the unprecedented need for inventions which has ensued. It must be realized that the development and administration of inventions and patents involve business problems which should be handled in an intelligent business-like way. The present haphazard, futile manner of treating them makes for lost motion and waste of effort.

The Bill here under consideration grants the authority to try out essentially an experiment in constructive economics which, if successful, can not fail to lead to results of fundamental importance, and which, if unreasonable compensation to the patentee, in successful, will, by reason of the measure's purely permissive character, be self-elimina-

ting. It will be an inexpensive experiment, since its operation is aimed to be self-supporting.

The whole system of administration comprehended under its provisions will have to be constructed with the most sedulous care by men specializing in the work, keeping prominently in mind the cardinal fact that this is a matter of research and development. The value of the experiment, indeed the span of its operation, depends upon the wisdom and circumspection with which it is handled. Being something absolutely novel in patent legislation, there are no standards and no information for guidance, and these must be acquired as this administration proceeds, by experiment, just as in any other form of research work.

This Bill provides for centralizing the administration here planned. If this were left to each bureau of the government to work out as it saw fit, the authority thus scattered would result in endless confusion, duplication of effort, increase of expense and, through lack of proper equipment, failure to provide the means for constructive economic work on any adequate or feasible scale. This is practically the present situation and is what this Bill is aimed to correct. It is infinitely better to focus administration in one agency, providing service common to all, in and outside the government employ, such agency having the ability through enlarged opportunity, to specialize in this work and thereby to develop into a power for really great accomplishment.

Assisted and supported by the cooperation of all in interest and, through the larger perspective acquired by the study and correlation of the problems of all, this system insures the working out of administrative details in the most comprehensive way, making possible that sort of team work in the realm of invention that proved so necessary to success in this field during the world struggle just ended.

In this connection, Professor Millikan has already pointed out in *SCIENCE*,² that one of

² *SCIENCE*, September 25, 1919, p. 285, et seq.

the important facts demonstrated by the war was that inventive genius working without direction and correlation proved comparatively futile. Not one invention in the military field out of ten thousand offered the government by isolated inventors proved of any value whatever. It was only when the best scientific brains of the country were mobilized, through the Council of National Defense, into definite groups, each group specializing in some particular field, all being in cooperation and in close touch with similar groups of the Entente, that the weight of American inventive genius as a most important factor in winning the war began to be felt. From that moment, the submarine, the real problem of the war, was doomed. This grouping and coordinating of the country's scientists developed a vast amount of inventive material, the major part of which has a direct peace bearing of immense value, but which is in serious danger of being lost through the want of such an agency as herein contemplated to conserve, develop and administer it and to translate it into industrial application and use.

There are several special phases of the patent situation affecting the government and its workers as well as the public, which the economic administration here provided will fundamentally improve. For instance, there is at present no disinterested organization extensively studying the economic aspect of patents after they have left the patent office. The information available in this field has been derived solely from members of the patent bar, from manufacturers and from inventors. But each of these classes represents a special interest with a particular and partisan viewpoint and need. This bill, however, creates an agency which is peculiarly well equipped to study the subject in the broad light of patent administration on behalf of the public.

Again, it sometimes occurs in the government service that an invention is developed that the government would like to make use of, or to introduce for the benefit of the public, but which has an application not

broad enough to interest manufacturers. An instance of this is the Gibbs breathing apparatus which has proven so efficacious in mine rescue work. Heretofore, there has been no satisfactory way of accomplishing the production of such a device, there being no agency authorized to negotiate the business. Under this bill this agency would be provided.

There is another, allied type of invention which is of great importance to scientists, and so indirectly to the public, and which will secure development under this administration. This concerns improvements in scientific instruments and apparatus. The sphere of employment of these things being comparatively restricted, their manufacture does not ordinarily attract capital, and certainly yields no great profit to the inventors.

A situation in the patent field unsatisfactory to the government is encountered in certain cases where investigations are conducted jointly by experts of the government and those of outside agencies, such as universities, technical schools, state institutions, and industrial concerns. More and more of such cooperative work is being done, to the great benefit of both the government and industry. During the course of it, inventions are sometimes evolved through the mutual efforts of the cooperators, and patents are granted therefor.

Now, it is highly important, if not absolutely imperative, that such a patent, or group of patents, be administered and developed as a unit, but the problem is at once presented as to how this shall be accomplished, to the end that the maximum benefit to industry shall be secured, the patent shall be guarded against falling into adverse hands, the control of the government over the production of its experts shall be maintained, and, at the same time, the equitable interests of the inventors shall be conserved. It is conceived that the solution will be found in the administration here provided.

Perhaps no discoveries in history exceed in importance those made in the last century concerning the nature of diseases, their prevention and cure, yet the people who have

made these discoveries have frequently gone unrewarded. The salaries of pathological professors are, as a rule, barely more than pittance, although their work is of transcendent importance to the human race. Increased practise through possible gain of prestige, by accomplishment, does not make up to these men the reward which should be theirs, and even the money thus acquired is no real reward, but remuneration earned by additional labor. Indeed, pathological work often tends to detract from the earning power of physicians as people are only too prone to regard research workers in the field of medicine as faddists and charlatans. The discovery of vaccination, by Jenner, almost ruined him. This situation influenced the British government to provide him with a pension.³

This leads to a further phase of the patent situation that has bearing here. It is contrary to the ethics of the medical profession for its members to patent new devices and curative agents. The consequent absence of patent protection eliminates control of these things, though control in many instances is vitally necessary. Great harm has been worked by the manufacture of medicines getting into adverse hands, and it has been necessary in some cases to have special legislation passed to relieve the situation.

Under the measure here proposed such inventions, fraught with great possibilities for good or ill, may be wisely administered for the welfare and protection of the public. To quote from an editorial written upon this Bill in the *Journal of the American Medical Association*, December 20, 1919 page 1887:

It has been regarded as against the principles of medical ethics to patent instruments or medications for personal gain. However, as was pointed out recently in *The Journal*, this does not mean that patenting per se is wrong; in fact, it is at times desirable to patent new discoveries, especially drugs, in order to insure reliability. The problem has been how to make available the patented product in the interest both of the public and of medical science. It would seem that the proposed bill

³ SCIENCE, November 14, 1919, p. 461.

suggests a means, acceptable to the medical profession, for the control of patents in the fields of medicine and surgery; the success will depend on the wisdom exercised by the Federal Trade Commission in the method of granting licenses. Judging from the recent activities of this body in the licensing of former enemy owned patents (such as barbitol, procain and arsphenamin), a wise policy will probably be followed. The bill, as proposed, gives opportunity for the medical research worker to obtain recognition, and possible emoluments, for distinctive contributions, without making him subject to criticism. It contains many constructive possibilities and should receive the endorsement of those interested in the altruistic success of science.

Along allied lines in veterinary medicine, processes for producing serums for prevention of diseases among farm animals have been worked out from time to time in the Department of Agriculture. It is very necessary to control these by patents properly administered in the public interest to prevent exploitation of, and loss to, the public.

In the interest of, and in justice to the inventors in the government service, let it be pointed out that save in rare and exceptional instances, they have derived little or no material return from their inventions. It is a general custom among industrial employers to reward their employees directly for valuable inventions which they evolve in the regular course of their duties, either by sums of money, as bonuses, or by increase of salary, or by gift of stock or some other tangible form of interest in the business, as a recognition of merit and a stimulation to further effort. This has proved a sound business policy. Nothing analogous thereto has existed in government employment, except that general excellence of service has always been a determining factor in routine promotions. Furthermore, inventors in the government service have had to pay out of their own slender means all charges incident to the granting of patents assigned by them to the government. This has been in the past a means of preventing applications for patent protection to worthy inventions.

Scientific workers, of which inventors form

a class, are notoriously deficient in commercial instinct and experience. Even under the most favorable circumstances they are rarely ever able to properly develop and commercialize their inventions. How hopeless, therefore, is the chance of government inventors getting any benefit for themselves and for the public out of their inventions under the condition of uncertainty of status and lack of development and administrative control now prevailing in the government bureaus.

In the matter of licensing, as provided by this Bill, it is not the purpose here to give unduly a monopoly to any one. Indeed, this whole thing will be so directly open to public examination and check that it is not at all likely such a thing would develop. The main idea in this respect is to do two things. To supply the public with a commodity or a device at a reasonable price, and, at the same time, to aid in building up American industry; providing protection to those best qualified for production, but allowing enough licensing to induce competition and thus to stimulate healthy advancement.

An analogy here might be found in the banking laws of Massachusetts, Wisconsin and of some other states, which provide for just enough banking facilities to insure proper and adequate administration in this field, it being recognized that an excess in the number of banks means the carrying of too much overhead for the business done, which is a bad business policy liable to lead to disaster. Under these provisions, before a new bank can be established it is necessary for its organizers to prove to the banking commissioners that there is a real need for it in the region where it wishes to operate.

Again, the patents comprehended under this legislation may be regarded as much the same sort of monopoly as a public franchise; for instance, the charter for a street car line. Only as many car lines are permitted in a city as there is a real need for.

It is believed that the provisions of this Bill form a basis for a plan broad enough to work out the solution of the sort of problems referred to above, no attempt being made to

obtrude mandatory regulations in any present system for coping with them. Under it the relation between the inventor in the government service to the government itself is clearly established, and the inventor will be encouraged by the knowledge that he will not be deprived of credit for the work of his genius, and, in the event of his invention proving of actual public service, he will receive some material return therefrom. No question of ethics can arise to embarrass him and he will be relieved of all care and expense in the administration and disposal of his patents.

The government derives its advantage under this measure in the stimulation of inventive productiveness among its workers, in the control it obtains thereof, and in the valuable experience it gains in this field of practical economics, which will very probably be reflected in improvements in patent law.

The public reaps its benefit by having cleared away the obstacle heretofore existing between the inventor's genius and the full and proper industrial application thereof, thus liberating and giving impetus to invention, with consequent increase of productiveness, tending toward improvement of working conditions and general prosperity.

ANDREW STEWART

BUREAU OF MINES

THE USE AND ABUSE OF THE GENUS

I SHOULD hesitate to burden the readers of *SCIENCE* with another technical discussion on nomenclature but the question which I wish to bring to the consideration of systematists is not a technical one and has nothing to do with Codes nor with priority.

We are all painfully familiar with the changes that are continually taking place in generic names, both of animals and plants. Such changes fall, roughly speaking, into two categories:

- (1) Cases where an older name for the same group is discovered in some overlooked work and is substituted for the one in general use.
- (2) Cases where a generic group is subdivided,

the old name being restricted to one of the subdivisions and new names given to all the others.

The first sort of change is necessary and is governed by a definite code of rules which is rapidly effecting international uniformity, so far as such cases are concerned. The second set of changes, however, is entirely dependent upon personal opinion, with no hope of uniformity or finality. Generic groups are separated from one another by all degrees of difference and there is no standard by which the amount of difference may be consistently measured. Consequently no two systematists will be in agreement as to how many groups may be recognized in any given family.

Ever since the time of Linnæus generic groups have been undergoing disintegration until in some families the ultimate condition has been reached of a generic group for every species. When this stage has been attained we have lost all trace, in the scientific names of any relationship whatever between the species. The binomial name in other words has become useless and we might just as well have a mononomial. The very object for which the generic name was proposed has been lost.

To illustrate the point further, suppose that we subdivide an old genus into three, and use three generic names where previously we used but one, we emphasize, it is true, that there are differences between these three groups, but by the very same act we obliterate the fact, formerly indicated by the single generic name, that there are resemblances which join these three groups together as compared with other groups in the same family. One of these facts would seem to be of quite as much importance as the other and by the creation of the new genera we lose quite as much as we gain. We should carefully guard against allowing our enthusiasm for the discovery of differences, to blind us to the fact that the real object of systematic research is the discovery of true relationship.

Now the whole trouble in this matter—and a vital flaw, to my mind, in our system of nomenclature—is that we try to make a double use of our system with the result that it is

gradually breaking down from the impossible burden.

A generic name as we use it to-day is made to serve two purposes. It is, (1) a term by which we indicate to others what we are talking or writing about, and (2) a term by which the systematist indicates what he regards as a recognizable phylogenetic group.

It is suicidal for any system of nomenclature that names for "things" should be constantly changed to fit our ever changing ideas of their relationships. Surely there should be some way of indicating the progress of our studies in the relationships of birds, for instance, without rendering unintelligible to all save a few specialists, the very names by which we refer to those birds.

We are already striving to find a solution of this problem, as is evidenced in the growing tendency to abandon the technical name entirely in semi-scientific publications in favor of the English name, and restricting the constantly increasing generic terms to systematic or phylogenetic discussions. It seems to me, however, that there is another way open. If we could be content to use the broader generic terms of a few years ago for *nomenclatural* purposes and use another term, call it subgenus or what you will, for further systematic refinements, without incorporating it in the name itself, we should accomplish our aim.

We make no effort to incorporate in the scientific name of an animal or plant its family relationship, and we arrange animals and plants according to geographical relationships without insisting upon modifying the name to indicate such relationship. Why then should we insist upon impairing our system of nomenclature by constantly changing the generic names every time we change our minds as to how many minutely different subdivisions we are going to recognize in the group?

It is very easy to ridicule my proposal to use broader generic terms for nomenclatural purposes by saying that we do not wish to return to the ideas of Linnaeus, and place for example the Swallow, the Swift and the Pratincole in the same genus, or to have only one generic name for the sparrows and one for the warb-

lers. This is very true and it is perfectly obvious that we must adopt some position midway between the two extremes, while at the same time we must frankly admit that such a position can only be reached by a purely arbitrary decision as to how many genera we are going to recognize. In any Check-list or monograph, however, we settle this matter by arbitrary decision anyway, as we have no criterion as to what constitutes a distinct genus. Therefore why not adopt an arbitrary set of genera *de conveniencie* so far as nomenclature is concerned and use subgeneric terms when we desire to call attention to more refined phylogenetic groups. At the present time we constantly make use of "group" names in discussing the relationships of different sets of species in a large genus without in any way interfering with the nomenclature and the practise could just as well be extended.

I do not propose any radical action in the way of lumping present-day genera. In birds, with which I am most concerned, the genera of the A. O. U. and B. O. U. Check-lists could be taken as a point of departure and with some slight alterations and adjustments be adopted. The main point would be to check the excessive generic subdivision which is to-day rampant in certain quarters. If some such reform be not inaugurated technical nomenclature will soon be—if it is not already—useless to anyone but a narrow specialist.

For example the botanist has long known of the differences between the so-called flowering dogwoods and those without involucreal leaves, but what profit does he gain by changing the generic name of the former to *Conoxylon* compared to the loss that he inflicts upon the ornithologist, the entomologist, or the student of general scientific interests, who knew them under the name *Cornus* and who, unless they be Greek scholars—a rapidly expiring race by the way—have no conception of what sort of herb, shrub or tree a *Cynoxylon* may be. So too the unfortunate botanist who may have learned to know certain sparrows as species of *Ammodramus* fails utterly to recognize his old friends under the names *Thryospiza*, *Ammodramus* and *Passerherbulus*.

Is it small wonder that the majority of us are turning to the use of English names except in some group with which we happen to be familiar.

I am perfectly aware that the systematist who concerns himself only with questions of the number of species and genera and the names for the same, in a single branch of science in which he specializes, will regard my remarks as pure rubbish. We must all admit, however, that specialization makes us blind to the views of outsiders and to some of the broader aspects of our specialty. Things that seem to us from long association as necessary, may be found upon unbiased consideration, susceptible of very important modifications and the present problem seems to be one of these.

In presenting these ideas I do not wish to be misunderstood. I do not wish to be placed in the same category as the carping critic of all nomenclatural changes who, by the use of clever sarcasm, appeals to the multitude who know as little about the facts as he does himself. I am a staunch supporter of the International Code of Nomenclature and all of the changes which its enforcement requires. They are necessary for ultimate stability and are happily permanent. I would encourage the study of geographic variation in the species and the establishment of subspecies since no matter how many of the latter we may have, their relationship to specific groups is always clearly indicated by the accompanying specific name.

I would encourage, to the fullest, research into the relationship of species, with however as much consideration for their resemblances as for their differences, and I would endorse the establishment of as many groups as may be desired under subgeneric headings—or any other term that may be preferred—but let us not insist upon introducing our conclusions on this matter into the technical name with the result of seriously impairing the principal use of that name.

Let us be conservative in the number of generic names that we recognize, and let general utility have a voice in the matter, of equal weight with that of the splitter and the lumpers,

just as to-day in another field of discussion the public is becoming recognized as a third party on an equal footing with labor and capital.

WITMER STONE

ACADEMY OF NATURAL SCIENCES,
PHILADELPHIA

OSCAR A. RANDOLPH

DR. OSCAR A. RANDOLPH, associate professor of physics in the University of Colorado, lost his life in a snow storm on April 11, during a trip to the Arapohoe Peaks on the Continental Divide. He made the trip with one companion Mr. Ellett, also of the department of physics, for the purpose of photographing winter storm scenes. They ascended to an altitude of about 12,500 feet and then descended into what is known as the Hell Hole. On the trip Dr. Randolph became ill and was unable to overcome the handicap of a sudden heavy fall of snow accompanied by bitter cold. Mr. Ellett had assisted him on the return trip till they were both exhausted. Mr. Ellett then protected Dr. Randolph with all the means at his command and started for help at the cabin of two trappers who were living some five miles away. In his weakened and confused condition he wandered for several hours without making much progress in the deep snow. One of the trappers finally found him and learned of Dr. Randolph's condition. Dr. Randolph died however before the trapper could reach him. Owing to the fact that both men were experienced mountaineers and had often made trips to the peak their friends at the university did not become alarmed till noon on April 12, when a rescue party started for the scene. Mr. Ellett, though terribly exhausted and somewhat frozen, will recover.

O. C. LESTER

ALFRED J. MOSES, 1859-1920

By the death, on February 27, of Alfred J. Moses, professor of mineralogy at Columbia University, the science of mineralogy has lost one of its most eminent and valued exponents. Professor Moses's work as a teacher, as a

writer and as a scientific investigator can hardly be too highly esteemed and his loss to all branches of his profession is most keenly felt. His text-book on "Mineralogy, Crystallography and Blowpipe Analysis" will for many years remain the standard in a large majority of the universities in which courses in these subjects are given. His work on "The Characters of Crystals," published in 1899, is the first treatise published in America upon physical crystallography, a branch of crystallography which was early recognized by him as of primary importance to chemists, geologists and mineralogists and which has within very recent years assumed a scope, and developed practical applications which have more than justified his early visions of its future.

The research work of Professor Moses was marked by a conservative distaste for announcing a result until he had thoroughly verified it. This admirable tendency was also evidenced in the terseness and finished quality of his statements of fact, whether written or spoken. He was seldom under the necessity of erasing a word from his lecture notes or modifying a statement made to any one consulting him, whether student or scientist.

His personal dealings were marked by a large sympathy coupled with a modesty which was almost shrinking in its avoidance of the prominence which was by reason of his attainments thrust upon him. Yet his vision and enthusiasm for his science was such as to inspire those who worked in close touch with him, and who will long treasure his memory as a master in science, as a man of large ideas and high attainments and as a sympathetic and valued friend.

H. P. W.

SCIENTIFIC EVENTS

INVESTIGATIONS IN POLYNESIA

Two problems of outstanding importance in the study of native races are the Origin and Migration of the American Indian, and the Origin and Migration of the Polynesian race. A study of the first problem has been made possible by the gifts of Morris K. Jessup to the American Museum of Natural History,

as a result of which ethnologists, botanists and zoologists are tracing the American tribes back through British Columbia and Alaska to Siberia and the regions beyond.

The Polynesian problem is in some respects more difficult than the Indian problem because it involves the collection of scattered data from hundreds of islands, some of them no longer inhabited, and the separation of racial traits and interlocked customs and languages of Polynesian, Melanesian, and Micronesian peoples. It probably can be solved by carefully organized investigation in widely separated areas over a period of years.

It is an undertaking which if adequately supported involves the expenditure of about \$50,000 a year for a period of four or five years. But the problem of a vanishing race is so urgent that even a one-year study is likely to yield large return.

It is generally recognized that the institution best suited to carry on the Polynesian work is the Bishop Museum of Honolulu, founded and endowed for studies in Polynesian, ethnology and natural history. With this in mind, funds sufficient for one year's work, contributed to Yale University by Bayard Dominick, of New York City, have been placed at the disposal of the trustees of the museum. Investigations resulting from the use of these funds will be credited to the "Bayard Dominick Expedition." In the hope that further funds will be contributed for this work, the director has formulated a program for two years' study which in outline is as follows:

A. 1920-21: Parties consisting of an ethnologist, an archeologist, a botanist, with necessary interpreters and assistants to be stationed at what might be termed strategic points to make studies essential in establishing standards of physical form, material culture, traditions and language of the Polynesians. This is essential as a basis for the determination of the significance of changes brought about by the overlapping with other races. For this work the existing means of transportation combined with the use of local small boats is fairly satisfactory. The areas

selected are Marquesas Islands, Austral Islands, Tongan Islands, Hawaiian Islands.

B. 1921-22: A boat with a crew and staff of scientists to make careful observations, in selected localities along the route Honolulu, Wake, Marshall, Eastern Carolinas, Gilbert, Ellice Islands, Samoa, Tonga, Friendly, Cook, and Society Islands, returning to Honolulu via Tongareva, Malden, Christmas and Fanning Islands. In connection with the previous year's work this cruise should aid in determining through what place or places in the "Polynesian Sieve" the ancient migrations came.

THE PAN-PACIFIC SCIENTIFIC CONGRESS

As the result of informal conferences and much correspondence, a scientific congress has been organized to meet at Honolulu, August 2 to 20, 1920.

The purpose of the congress is to outline scientific problems of the Pacific Ocean region and to suggest methods for their solution; to make a critical inventory of existing knowledge, and to devise plans for future studies. It is anticipated that this congress will formulate for publication a program of research which will serve as a guide for cooperative work for individuals, institutions and governmental agencies.

Representative scientists from the countries whose interests in whole or in part center in the Pacific will be present, and a number of men whose researches demand a knowledge of the natural history of the Pacific islands and shore lands have expressed their intention to attend.

The program of the conference is in the hands of the Committee on Pacific Exploration of the National Research Council, which consists of the following members:

John C. Merriam, University of California, chairman; Wm. Bowie, U. S. Coast and Geodetic Survey; R. A. Daly, Harvard University; William M. Davis, Harvard University; Barton W. Evermann, California Academy of Science; Herbert E. Gregory, Yale University; E. B. Mathews, National Research Council; George F. McEwen, Scripps Institute; Alfred

G. Mayor, Carnegie Institution; William E. Ritter, Scripps Institute.

The meetings will be arranged to place emphasis on the following topics:

1. Research desirable to inaugurate; projects described in considerable detail with reference to their significance, and their bearing on other fields of study. Investigations designed to lay the foundation for a higher utilization of the economic resources of the Pacific may be included.

3. Methods of cooperation with a view to eliminating unnecessary duplication of money and energy.

4. The best use of the funds now available and the source of further endowments.

In addition to those maintained by the Federal and Territorial governments, the active scientific organizations of Hawaii include the Bernice Pauahi Bishop Museum of Polynesian Ethnology and Natural History, the College of Hawaii, the Sugar Planters' Experiment Station, The Marine Aquarium and the Volcano Observatory.

Between Honolulu and San Francisco regular sailings are maintained by four steamship companies, and established routes bring Hawaii into connection with Canada, New Zealand, Australia, the Philippines, China and Japan. In order to procure desirable accommodations, reservations for both outward and return passage should be made at an early date.

Further information if desired may be obtained from members of the Committee on Pacific Exploration or from the undersigned.

HERBERT E. GREGORY,

Chairman, Pan-Pacific Scientific Congress

BERNICE PAUAAHI BISHOP MUSEM,

HONOLULU, HAWAII,

March 20, 1920

APPROPRIATIONS FOR THE NEW YORK STATE COLLEGE OF AGRICULTURE

THE Governor of New York State has signed the annual appropriation bill, providing for the maintenance and future development of the State College of Agriculture at Cornell University. The college thus becomes assured of a total appropriation of \$1,787,888.80, of which \$517,000 is for the erection of

new buildings and \$14,530 for the State Game Farm,

Although the new law makes only a little more than half a million dollars available at once for new construction, it directs the state architect to prepare plans for the further extension of the college; and it authorizes the board of trustees, following the architect's plans, to enter into contracts for additional construction to the amount of \$3,000,000.

The remaining \$1,256,358.80 is for the salaries of the staff and expenses of operation during the fiscal year from July 1, 1920, to June 30, 1921. This appropriation is larger than last year's by \$282,855, of which about two thirds will go for increased salaries.

The law also provides for some new officers of administration, principally a vice-dean of resident instruction and a vice-director of the Experiment Station. There is already a vice-director in charge of the extension service. The filling of the new positions will therefore complete the administrative organization in the three chief phases of work which the law requires of the college.

SELENIUM AND TELLURIUM

At the recent meeting of the American Chemical Society in St. Louis a report of progress of the sub-committee of the National Research Council on The Uses of Selenium and Tellurium was presented by Victor Lenher, of the University of Wisconsin, at the request of the Engineering Division of the National Research Council. This sub-committee is working in close contact with all of the producers of selenium and tellurium in the country, and is carrying out one of the ideals of the National Research Council, which is to promote and co-ordinate research work in every direction.

The source of selenium and tellurium is in the anode mud from the electrolytic refining of copper. Copper refineries can annually produce under present conditions approximately 300,000 pounds of selenium and about 125,000 pounds of tellurium. A few hundred pounds of these elements would amply supply the market to-day. The large amounts of these elements available and for which there is no practical use, has caused the National Research

Council to create a committee whose duty it is to find possible methods for their utilization. This committee consists of Arthur E. Hall, chairman, H. G. Greenwood, Victor Lenher, O. C. Ralston, E. W. Rouse, S. Skowronski and A. W. Smith, and it has been working in close contact with the producers of selenium and tellurium. Arrangements have been made whereby large quantities of these elements can be procured for experimental purposes at cost price from the Raritan Copper Works, Perth Amboy, N. J., the United States Metals Refining Co., Chrome, N. J., the American Smelting and Refining Co., Omaha, Nebraska, and the Baltimore Copper Smelting and Rolling Co., Baltimore, Md.

Mr. E. W. Rouse, of the Baltimore Copper Smelting and Rolling Co., Baltimore, Md., will ship at any time reasonable quantities of selenium gratis to investigators upon the recommendation of the Committee of the National Research Council on the Uses of Selenium and Tellurium. Mr. Arthur E. Hall, of the Omaha plant of the American Smelting and Refining Company, will forward reasonable quantities of tellurium gratis under the same conditions.

PHYSICAL AND CHEMICAL CONSTANTS

THE American Chemical Society at its St. Louis meeting passed the following resolution:

WHEREAS, every industry, for its successful operation, depends upon an accurate knowledge of the properties of the materials it uses and produces and the numerical values of these properties which are known as their constant, and

WHEREAS, during the war, it became evident that much of the published data on these constants was found to be extremely inaccurate, entailing considerable loss in time and money and it was found in many cases that data very much desired was not to be found in published records, and

WHEREAS, up to now publication of such constants in tabular form has been mostly in some foreign language and consequently of limited availability, and

WHEREAS, under allotment by the Inter-Allied Council and the International Research Council, the National Research Council of the United States (an organization duly created by the President of the United States) has decided that this deficiency

could best be met by the compilation and publication in English of tables of constants which have been critically reviewed as to their accuracy and has decided that this could best be done by the appointment of a committee to act as trustees in charge of such compilation and as far as is necessary to have charge of the determination of such constants as have not already been published or determined, and

WHEREAS, the trustees so appointed were selected as representing the American Chemical Society, the American Physical Society and the American Institute of Chemical Engineers, the representatives being, respectively, Julius Steiglitz, Edwin P. Hyde and Hugh K. Moore, therefore be it

Resolved, that the American Chemical Society in convention assembled heartily endorses this project and promises to the trustees its support in every way within its power.

SCIENTIFIC NOTES AND NEWS

THE American Philosophical Society on April 24 elected members as follows: Wilder D. Bancroft, Washington; Gary N. Calkins, New York; Edward Capps, Princeton; Heber D. Curtis, Mt. Hamilton, Calif.; Leonard E. Dickson, Chicago; William Duane, Boston; Moses Gomberg, Ann Arbor; Frank J. Goodnow, Baltimore; John F. Jameson, Washington; Douglas W. Johnson, New York; Vernon L. Kellogg, Stanford University, Calif.; George F. Moore, Cambridge; Paul Shorey, Chicago; William C. Sproul, Chester, Pa., and Pope Yeatman, Philadelphia.

THE Academy of Natural Sciences of Philadelphia has conferred the Hayden Memorial Medal for 1920 on Professor Thomas Chrowder Chamberlin, professor emeritus of the University of Chicago, in recognition of his distinguished services to geologic science. This medal is presented every three years for distinguished accomplishments in geology or paleontology. It represents a memorial established by an endowment fund by Mrs. Emma W. Hayden in honor of her husband, Dr. Ferdinand V. Hayden, who was for many years director of the Geological and Geographical Survey of the Territories. The medal was first presented to James Hall, formerly state geologist of New York, in 1890, and has since been presented to

various distinguished geologists both in America and in Europe. In the opinion of the Committee on the Award, Professor Chamberlin's numerous and remarkable contributions to geologic science place him in a rank high among the others who have received the Hayden Memorial Medal.

DR. VICTOR C. VAUGHAN, of the University of Michigan, has been elected a member of the Institute of Medicine of Chicago.

PROFESSOR A. FOWLER, F.R.S., has been elected a corresponding member of the Paris Academy in the section of astronomy.

ON the occasion of the dedication of its new Agricultural Engineering Hall at University Farm on April 14, the University of Nebraska conferred the honorary degree of doctor of agriculture upon Roscoe W. Thatcher, dean of the department of agriculture and director of the agricultural experiment stations of the University of Minnesota, and the honorary degree of doctor of engineering upon Charles Rus Richards, dean of the college of engineering and director of the engineering experiment station of the University of Illinois. Dean Richards delivered the dedicatory address.

THE intimate international relationships with English and Continental laboratories held by the members of the nutrition laboratory of the Carnegie Institution of Washington, in Boston, Mass., which were interrupted by the war, are again to be resumed. Professor Walter R. Miles, of the department of physiological psychology of the Nutrition Laboratory, has recently left for an extended tour in European countries and for attendance at the International Congress of Physiology to be held in Paris in July.

DR. J. WALKER FEWKES, chief of the Bureau of American Ethnology, will return to the University of Texas in June to continue the work of archeological research begun last year. During Dr. Fewkes' former visit to Texas investigations were made of the Red Burnt Mounds extending from east of Austin westward beyond the New Mexico boundary.

DR. JOHN L. TODD, of McGill University, and Dr. Simeon B. Wolbach, of Harvard Medical School, have gone to Poland to study typhus fever. They are working under the Red Cross.

DR. DON M. GRISWOLD has been appointed state epidemiologist of Iowa to succeed the late Dr. E. G. Birge. Dr. Griswold will also act as head of the division of hygiene, preventive medicine and epidemiology of the department of pathology and bacteriology of the University of Iowa.

DR. E. G. TITUS, technologist in sugar-plant investigations, U. S. Department of Agriculture, who has been in charge of seed-breeding and other sugar-beet investigations in the intermountain region, has accepted a position with the Utah-Idaho Sugar Company, Salt Lake City, as director of their new department of agricultural research.

PROFESSOR O. M. LELAND, of Cornell University, has accepted a position with the J. G. White Engineering Corporation and has taken up his work at their offices in New York City. He has been a member of the faculty of civil engineering at Cornell for seventeen years. During the war, Professor Leland was in active service as Lieutenant Colonel of Engineers, in the 78th Division, and, after the Armistice, in the 89th Division.

DR. JAMES BROWN, formerly research chemist for Zinsser and Co., Hastings-on-Hudson, N. Y., has accepted a position as research chemist with the Calco-Chemical Company, of Bound Brook, N. J.

PROFESSOR R. A. SAMPSON, F.R.S., astronomer royal for Scotland, has been appointed Halley lecturer in the University of Oxford.

THE courses and conferences arranged for the physicists and mathematicians who will be assembled at the University of Chicago during the summer quarter, beginning on June 21 and ending about September 1, include the subject of the General Theory of Relativity, by Dr. A. C. Lunn; the Theories of Quanta and Theories of Atomic Structure, by Dr. R. A. Millikan; New Developments in Optics, by Dr. H. G. Gale; Thermionic Phenomena and their Applications, by Dr. A. J. Van der Bijl, of the Re-

search Laboratory of the Western Electric Company; the Theory of Sound, by Dr. Lunn; and Electro-Magnetic Theory, by Dr. A. J. Dempster. The facilities of the Ryerson Laboratory for research and conference purposes are extended to professors holding the doctor's degree from other institutions. A considerable number of physicists of this type are to be in attendance.

SIR RICHARD GLAZEBROOK, late director of the National Physical Laboratory at Teddington, England, was presented on March 17 by the staff with his portrait in oils, painted by his cousin, Mr. Hugh de T. Glazebrook. Accompanying the gift was an album, containing an illuminated address, followed by the signatures of past and present members of the staff and a photograph of the laboratory taken from an aeroplane. Mr. F. E. Smith, F.R.S., who presided, and Dr. T. E. Stanton, who made the presentation, reviewed the rise and progress of the laboratory under Sir Richard, and referred to the harmony that had always existed between him and the staff. Sir Richard Glazebrook thanked the staff for their gift, and, speaking of the future of the laboratory, said he was sure Mr. Balfour and the members of the council had its interests very seriously at heart, and would do all they could in the future to promote its prosperity. There was an intention on the part of the Ministry to carry on the study of aeronautics, which had been an important feature in the work of the laboratory in the past, and he hoped that place would be made one of the centers where research work would be continued.

At the meeting of the Institute of Medicine of Chicago on April 16, Professor R. A. Millikan, professor of physics at the University of Chicago, presented a paper on "Twentieth century contributions to our knowledge of the atom."

PROFESSOR VERNON KELLOGG recently addressed the New York Alumni Society of Phi Beta Kappa, and also the Washington Academy of Sciences, on "Europe's food in war and armistice."

DR. WILLIAM CURTIS FARABEE gave an address on "Ethnography at the Peace Conference" before the University of Pennsylvania chapter of Phi Beta Kappa at its twentieth anniversary meeting on April 15. At the same meeting Dr. Farabee was elected to honorary membership in the society.

DR. FRED HEYL, of the Upjohn Company, Kalamazoo, Michigan, recently lectured before the chemical department of Yale University on "The application of organic chemistry in the pharmaceutical industry." The next speaker in this course of industrial lectures being given this year in the Graduate School will be Mr. Walter S. Landis, of the American Cyanamide Company, who will give three lectures dealing with the "Fixation of nitrogen."

THE Lady Priestley Memorial Lecture of the National Health Society was given by Sir George Newman, K.C.B., M.D., F.R.C.P., on Thursday, April 22, at the house of the Royal Society of Medicine. The title of the lecture is "Preventive medicine: the importance of an educated public opinion."

PLANS have been made for an expenditure of about \$10,000,000 for the establishment of "a medical center" at Walter Reed General Hospital, Washington, D. C. The hospital is to be gradually developed into one of the main hospitals of the Army, by the building of two additions to the main hospital building for various uses such as medical and surgical wards, dental department, laboratory, eye, ear and throat department and dispensary. Most of these activities now are housed in temporary buildings. The Mayo Brothers, of Rochester, Minn., will assist in the approved project for increasing its usefulness on modern lines.

THE Migratory Bird Act of 1918, designed to carry out provisions of a treaty between the United States and Great Britain for the protection of migratory birds, has been held constitutional by the Supreme Court. The statute was attacked by Missouri authorities, who alleged that it interfered with the sovereignty of the state and with the property right of the people of that state.

EDUCATIONAL NOTES AND NEWS

THE General Education Board has contributed \$350,000 to the Endowment Fund of New York University, to endow the work in engineering and collegiate work. It is conditional on the raising of a total fund for these purposes of \$1,200,000 and the clearing off of the floating indebtedness of the university, now amounting to approximately \$400,000.

ANNOUNCEMENT is made of the establishment in the Yale Graduate School for the year 1920-1921 of a research fellowship in organic chemistry by the National Aniline and Chemical Company of New York. This fellowship is supported by a gift of \$750, and the recipient must be a candidate for the degree of Doctor of Philosophy.

THE total civil service estimates of the year in Great Britain are put at £557,474,899. One of the largest increases is for the Board of Education. The following are typical increases:

	Estimated for 1920-21 £	Granted for 1919-20 £
Board of Education ..	45,755,567	32,853,111
British Museum	294,233	219,714
Scientific investigation, etc.	208,416	113,974
Scientific and Industrial Research	518,298	242,815
Public Education in Scotland	6,877,220	4,677,220

A ROYAL Commission has been appointed to inquire into the financial resources and working of the University of Dublin and Trinity College, Dublin. The commission is to consider the application for state financial help which has been made by the university. It will consist of five members with three as a quorum. The names of those appointed are: Sir Archibald Giekie, O.M., K.C.B., F.R.S.; Sir John Ross, Bt., Judge of the Chancery Division of the High Court of Justice in Ireland; Dr. A. E. Shipley, D.Sc., F.R.S., Master of Christ's College, Cambridge; Professor J. S. E. Townsend, F.R.S., Wykeham professor of physics and fellow of New College, Oxford; and Professor John Joly, F.R.S., professor of

geology and mineralogy in the University of Dublin. Professor Gilbert Waterhouse, LL.D., professor of German in Dublin University, is to be the secretary to the commission. The commission will investigate the administration of the existing financial resources, and also the constitution both of the university and of Trinity College, and may make interim reports if it wishes to do so.

DR. L. D. COFFMAN, head of the department of education at the University of Minnesota, has been elected president of the university to succeed Dr. Marion L. Burton, who is president-elect of the University of Michigan.

THE trustees of the Peking Union Medical College, Peking, China, announce the resignation of Dr. Franklin C. McLean as director of the college, and the appointment of Dr. Henry S. Houghton, formerly dean of the Harvard Medical School of China, at Shanghai, as acting director. Dr. McLean retires from the directorship in order to devote himself to the professional work of the department of medicine of the Peking College of which he is professor and head.

DR. LAWSON G. LOWERY, for three years chief medical officer of the Boston Psychopathic Hospital, has been appointed assistant professor in the psychopathic hospital of the University of Iowa.

DR. J. B. CLELAND has been appointed to the newly created chair of pathology in the Adelaide University, South Australia.

DISCUSSION AND CORRESPONDENCE

UNIFICATION OF SYMBOLS AND DIAGRAMS

THE recent attempts to unify the mathematical symbols used in physics and chemistry are probably approved, in principle, by practically every one. They have stimulated and guided a large amount of voluntary effort and cooperation. Their complete recognition and adoption has been hindered by the difficulty of getting any one system to satisfy the very varied requirements and personal preferences involved.

These two facts suggest, first, a further field for the applying of unifying methods,

and second, an advantageous way of making the application. The field is the great number of special or minor subjects; such as electron tubes, radio work, gas theory, calorimetry. The notations used in most of these would be better if more nearly unified; and this could much more easily be brought about if each subject is treated as deserving a notation of its own, founded on the general scheme, but having also a special development. Such a treatment of the special topics would probably help solve the conflicts which impede the general scheme also.

A possible advantageous method of getting the work done is for the committees in charge to act more or less as referees, allowing the authors of new papers to do a good deal of the work and even to furnish much of the initiative. Most scientific workers seem to be strongly of the opinion that unification in these numerous subjects is desirable, but among those who would most naturally be expected to take the lead there is a lively appreciation of the work and difficulties involved. These obstacles should be diminished by the plan here suggested. It really puts the committee in a position just opposite to that which similar committees have usually held. Instead of canvassing the whole field and submitting a complete system to be judged by others, the committee would have the final judgment, and the constructive part would be done mainly by active workers specially interested in each different subject, and specially familiar with it. It might be that each decision of the committee, like the decision of a court, would apply to a single case submitted to it, that is, to a single paper. Frequently, then, a brief might be submitted by the author, giving reasons for the desired selection of symbols, and some review of those used by previous writers in the same subject and in those allied to it. The method would thus be flexible and the results capable of modification, though as a rule after one important paper had been passed upon there would be very little more work for the committee in that particular subject.

Whether any such general plan as that just

suggested is ever followed or not, it is at least fairly clear that the use of symbols in the various special and restricted subjects can be regulated with far less perplexity and conflict than attends the attempt to provide a single system to fit the whole of a very complex science. Another important conclusion is that voluntary effort and cooperation can accomplish much, even without any formal committee. For instance, most of the existing diversities in symbols are due to inadvertence or negligence, not to real difference in opinion or taste. Most of them would have been avoided if writers had simply made it a rule to notice the symbols of their predecessors, and not make changes without any reason. There is little doubt that the majority of writers are willing to follow this rule as soon as their attention is directed to it. Where previous usage differs, or where some writer wishes to make changes for a reason, the individual writer's judgment may not be wise. In such cases cooperation, through correspondence or otherwise, between different writers is advantageous. Such cooperating writers, however, will usually desire the cooperation of a formal committee. Indeed, my own reason for venturing to present these suggestions to the public is that I happen to belong to a small group who are willing to make mutual concessions and so secure a uniform set of symbols in a new minor subject, and who wish to have their work in this direction given the improvement and greater promise of permanence that would come by having it passed upon by a recognized committee.

The symbols used in diagrams, and in many cases the forms of the diagrams themselves, can also gain by standardization. Certain familiar conventions have long been used in electrical diagrams, but in general the field is so divided and varied that here, even more than with the symbols used in equations, piecemeal and detailed standardizations seem at once easiest and most useful. Sweeping and absolute rules are almost sure to prove detrimental in some cases, and have aroused opposition. Even in striving for uniformity

the greatest uniformity is not necessarily always the greatest benefit. Moreover, a set of general rules, formulated once for all, does very little to unify the special and minor details, which are, if anything, the most important, since they are the most numerous, and hardest for the reader to remember. The value of general rules for symbols and diagrams will hardly be denied, but a large measure of attention to separate subjects seems likely at once to be of value in itself and to avoid much of the difficulty and conflict which have hitherto impeded progress in standardization of symbols by more wholesale methods.

WALTER P. WHITE

CARNEGIE GEOPHYSICAL LABORATORY

CARBON MONOXIDE

TO THE EDITOR OF SCIENCE: One of the characteristic by-products of our industrialism is carbon monoxide and the mild hysteria which one finds in certain parts concerning the possible accumulation of this compound in our atmosphere is interesting as an example of a little learning. The report of the press that a high percentage of this gas was discovered in some of our camps where automobiles, aero-engines and gas engines in general were operating has given color to the fears expressed by some of our scientists who should know better. There is probably more carbon monoxide produced during a severe lightning storm in a given locality than is emitted by our coke burners, gas engines and other sources in industry during much longer periods. The silent discharge which proceeds during storms in mountainous areas produces much of the gas. Now while carbon monoxide is inert chemically and scarcely absorbable by ordinary laboratory methods, under natural conditions there are sources of disposal which guarantee that the gas does not accumulate rapidly, at least, in our atmosphere. Chlorophyll "fixes" carbon monoxide in a stable way, so that much chlorophyll is lost to plants in regions where there is an unusually high concentration of the gas, being rendered impotent in photosynthesis by the attachment of CO. In like manner,

hemoglobin fixes carbon monoxide and in all probability a relatively large part of aerial CO is disposed of in this way. The hemoglobin binding CO is destroyed in the liver, the CO probably remaining attached to the protein end of the globin, and not to the biliary and urinary pigment which result from the decomposition of hemoglobin. The globin is excreted as urea, ammonia, etc., while some may be retained as amino-acid, but doubtless the CO globin is treated as foreign material and excreted. Another method of disposal of aerial carbon monoxide is the union in sunlight, with the halogens, bromine, iodine, etc., of our atmosphere and with the fluorine freed in the mountainous districts during storms involving lightning. In such cases, the carbon monoxide is converted to a carbonyl halide or to CO₂, in either case being capable of utilization by bacteria, plants with chlorophyll, etc.

The above communication was written previously to the publication of Lamb, Bray and Frazer's contribution from The Chemical Warfare Service entitled "The removal of carbon monoxide from the air" in the *J. Ind. and Engineering Chemistry*, March 1920, Vol. 12, p. 213. W. M.

THE ATTAINMENT OF HIGH LEVELS IN THE ATMOSPHERE

TO THE EDITOR OF SCIENCE: In the April 9, 1920, issue of SCIENCE, Dr. J. G. Coffin, on behalf of the Curtiss Aeronautical and Motor Corporation, questions the record of Major Schroeder, namely 36,020 feet, given in my brief review of high level records, in SCIENCE, March 19, 1920.

So far as I can now ascertain, Dr. Coffin is justified in questioning this particular record. The director of the Bureau of Standards informs me that the bureau has not yet determined the true altitude and that when determined it will be for the Air Service to make proper announcement. With such imperfect data, as I can now obtain, the approximate values are: Rohlf's, 9880.5 meters (32,418 feet); Schroeder, 9505.0 meters (31,184 feet). These are the elevations corrected for mean air column temperature, vapor pressure, gravity, alti-

tude and latitude. The main reduction factor is of course the temperature. These results, however, must not be accepted as final. Until final and authentic data are forthcoming, the justice of Dr. Coffin's criticism must be admitted. The words "The record now stands—Schroeder, February 27, 1920, 10,979 meters" in SCIENCE, No. 1316, p. 288, should be accepted with reservation.

Let us hope, however, that before the end of summer both of these plucky aviators will have attained a true height of 10,000 meters.

ALEXANDER MCADIE

BLUE HILL OBSERVATORY,
April 22

SCIENTIFIC BOOKS

Introduction to General Chemistry. By HERBERT N. MCCOY AND ETHEL M. TERRY. Chicago, Ill., 1919. Pp. viii + 605.

The subject matter covered in the course in chemistry given to the freshmen class at the University of Chicago is the basis for this text-book. It does not aim to include all the material usually considered in a course in descriptive inorganic chemistry; the facts of the science are used primarily to illustrate fundamental principles and laws. A brief statement of the order in which the material is treated will bring out the point of view of the authors. The first chapter deals with the measurement of gases. In the next four chapters the fundamental concepts of the science are developed; these include indestructibility of matter, a pure substance, an element, analysis of substances, law of definite composition derivation of formulæ. Acids, bases, and salts, water and solutions, the kinetic theory and the atomic hypothesis are next considered. A chapter on chlorine and its compounds with hydrogen and metals is followed by a consideration of chemical equilibrium, oxidation and reduction, heat and energy. Three chapters are devoted to the ionic hypothesis and one to electro-chemistry. Nitrogen, phosphorus, sulphur and carbon and their simple compounds are then described. A rather long chapter on organic chemistry in which structural formulæ are

freely used follows. Attention is next turned to the theory of dilute solutions, disperse systems, some additional elements, the periodic classification, and radio-activity.

In the discussion of the topics noted many chemical facts are brought before the student but stress is laid on principles and little space devoted to facts of general interest unless they serve as examples of these principles. For example, the only reference to the preparation of iron from its ores is a paragraph on carbon as a reducing agent, in which the statement is made that metallic iron is made from the mineral hematite by reduction with coke at white heat.

The book is clearly written. It will be of interest to teachers to see how rather difficult subjects can be handled effectively in a simple manner. It will be looked upon with favor as a text for beginners by those who desire to teach facts only through the use of laws and theories and do not think it advisable to unduly emphasize the applications of the science.

JAMES F. NORRIS

NOTES ON METEOROLOGY AND CLIMATOLOGY

RAINFALL INTERCEPTION BY TREES AND CROPS

FOR several years Mr. Robert E. Horton, consulting hydraulic engineer, Voorheesville, N. Y., has carried on investigations of the various aspects of rainfall in relation to runoff.¹ In such studies what the hydraulic engineer needs to know first is how much rainfall reaches the ground, over a watershed. Is it the amount of precipitation that as shown by well-exposed gages?² No. Much rain and snow is intercepted by trees, and evaporated.

¹ See "Additional Meteorological Data Needed by Engineers," by R. E. Horton, *Engineering News Record*, March 27, 1919, pp. 614-616; reprinted in *Monthly Weather Review*, May, 1919, Vol. 47, pp. 305-307.

² See "The Measurement of Rainfall and Snow," by R. E. Horton, *Jour. New England Water Works Assoc.*, 1919, Vol. 33, pp. 14-71, 21 figs., 12 tables; reviewed in *Monthly Weather Rev.*, May, 1919, Vol. 47, pp. 294-296.

Thus the hydraulic engineer, unlike the meteorologist, needs to study the catches of rain-gages under trees as well as in the open. [Some cooperative observers seem to have anticipated this need.] Mr. Horton has made a careful study of the amount of precipitation which falls through different kinds of trees and of that portion of the intercepted rainfall which runs down the trunks. Also, in order to enable him to form an estimate of the water which reaches the ground over a varied watershed he has determined the amount of rainfall intercepted by different growing crops in various stages. The results of his investigations have been published in the *Monthly Weather Review*.³

Mr. Horton concludes that

Rainfall interception represents a loss of precipitation which would otherwise be available to the soil. The loss takes place through evaporative processes, but may, for convenience be subdivided into (a) interception storage, and (b) evaporation during rain.

The amount of interception loss is primarily a function of the storage capacity of the plant surface, the duration of precipitation, and the evaporation rate during precipitation. Since there is generally a fairly close correlation between shower duration and amount of precipitation, estimates of interception loss can, for practical purposes, be expressed in terms of precipitation amount per shower.

The interception storage loss for trees varies from 0.02 to 0.07 inch per shower, and approaches these values for well-developed crops. . . . The . . . loss is greater in light than in heavy showers, ranging from nearly 100 per cent. where the total rainfall does not exceed the interception storage capacity to about 25 per cent. as an average constant rate for most trees in heavy rains of long duration. [Of this] the amount of water reaching the ground by running down the trunks of trees . . . is . . . commonly 1 to 5 per cent. of the total precipitation. The percentage increases from zero in light showers to a maximum constant percentage in heavy showers of long duration. Light showers are much more frequent than heavy ones, and the interception loss for a given precipitation in a month or season varies largely according to the rainfall distribution.

³ September, 1919, Vol. 47, pp. 603-623, 17 figs.

Expressing the interception loss in terms of depth on the horizontal projected area shadowed by the vegetation, the loss per shower of a given amount is very nearly the same for various broad-leaved trees during the summer season. . . . The interception loss from needle-leaved trees, such as pines and hemlocks, is greater both as regards interception storage and evaporation during rain than from broad-leaved trees.

Data are insufficient for a final determination of the relative losses from trees in winter and in summer. Apparently the winter and summer losses for a given monthly precipitation for needle-leaved trees the winter interception loss appears to be about 50 per cent. as great when the trees are defoliated as during the growing season. The average interception loss from 11 trees . . . during the summer of 1918 was 40 per cent. of the precipitation.

ATMOSPHERIC MOISTURE IN THE UNITED STATES

Three years ago, Mr. P. C. Day, chief of the climatological division of the Weather Bureau, published a monograph on "Relative humidities and vapor pressures over the United States, including a discussion of data from recording hair hygrometers,"⁴ and to which recently Mr. W. J. Bennett, of Tampa, Florida, has added an interesting discussion of tables prepared along similar lines for Tampa.⁵ The diurnal changes in *relative humidity* (which is the water vapor present in the air divided by the maximum which would be possible at the temperature) are practically the opposite of the temperature changes, there being a change generally of 3 to 4 per cent. for each change of 1° C. in temperature.

Vapor pressure (the pressure exerted by the water vapor locally in the air) is a direct index of the *absolute humidity* (water vapor per unit volume of space). In summer in dry climates, such as at Boise, Idaho, the vapor pressure rises during the few hours immediately after sunrise as the moisture from the surface (*e. g.*, dew) is evaporated. Then after

about 10 A.M. the vapor pressure decreases as convectional currents reach higher and higher and mix the lower air with the drier air above until the principal minimum is reached at about 6 P.M. After this, evaporation, even though small is able to raise the vapor pressure in the absence of convection. In a moderately humid climate, such as that of Columbus, Ohio, the maximum in summer comes at about 10, as in the drier region, but the minimum is not reached until sunrise, when cooling has condensed a maximum of the water vapor. In a marine climate, using San Francisco as typical, the vapor pressure depends almost entirely on the temperature, and so the maximum comes at about 2 P.M. and the minimum around sunrise.

In the annual period the relative humidity is usually highest with the lowest temperature; but the vapor pressure varies directly with the annual temperature changes. The vapor pressure is 2 to 4 times as great in summer as in winter in most of the United States. The distribution of relative humidity depends, (1) on the temperature of the air, (2) on the proximity of the main source of moisture, (3) on the prevailing wind direction, and (4) on the topography to windward. East of the Rockies, April is generally the month of lowest relative humidity; while west, the mid-summer months are driest. In most of the United States, the highest relative humidity comes in the colder months, except in the southeast where it may occur in late summer or early fall. The lowest relative humidities occur in the far southwest, and in the lee of high mountains elsewhere, while the highest occur near the oceans, similarly, on the lee shores of the Great Lakes, and on the windward sides of mountains. On Pikes Peak and Mount Washington the humidities are generally high and show little variation. In the western half of the country the record minima range from 2 to 10 per cent., while in the eastern half, the lowest are 10 to 20 per cent.

Since absolute humidity is controlled by temperature more than by any other factor for most of the country, the lowest vapor pressure comes in winter, and is experienced

⁴ *Monthly Weather Review*, Suppl. No. 6, 1917, 61 pp. (mostly tables), 34 charts. Cf. review in *Geogr. Rev.*, February, 1918, Vol. 5, pp. 155-156.

⁵ *Monthly Weather Review*, July and October, 1919, Vol. 47, pp. 466-468, 710, 2 figs.

in the coldest part of the United States. In summer, the lowest is in the lee of the Sierra Nevadas. It is rather surprising to learn that the July vapor pressures about Yuma-Arizona, in almost the hottest and driest part of the Arizona desert are as high as those about the cool Great Lakes. Nothing could emphasize more strongly the fact that we feel in terms of relative humidity rather than in terms of absolute humidity.

In all the humidity tables and maps of Mr. Day's contribution we see a complex weather element which depends on the two variables, temperature and moisture. Humidity maps are in this respect on a par with snowfall maps; but they are less complex than those of evaporation, in which wind enters as another factor.

CHARLES F. BROOKS

SPECIAL ARTICLES

LIMITS OF THE GENERA VANDELLIA AND URINOPHILUS

My monograph on the Pygidiidae was published September, 1918. I was not able to state the limits of the genus *Vandellia* nor to indicate the type of the genus *Urinophilus*. These minute fishes are found in the tropical lowlands of South America. They attach themselves to other animals and drink the blood. Some of them are said to enter the urethra of bathers, and being provided with erectile, retrorse spines on the opercles can not be withdrawn. If not excised they finally enter the bladder and cause death.

It was found during the preparation of the monograph that some of the species contain teeth on the mandibles, others not. It was not known whether the type specimen of the genus *Vandellia* contained mandibular teeth or not. The specimens are in the Jardin des Plantes, Paris, and were not accessible during the war. Dr. J. Pellegrin has recently examined these specimens and reports that the types of *Vandellia cirrhosa* Cuv. & Val. and of *V. Wieneri* do not have mandibular teeth and the name *Vandellia* may, therefore, be restricted to those species without mandibular teeth, *cirrhosa*, *plazai*, *wieneri* and *hasemani*.

The name *Urinophilus* becomes, thereby, restricted to the only known species with teeth on the tips of the mandibular rami, *Urinophilus sanguineus* (E.). The species *Urinophilus sanguineus* is known from one specimen, 62 mm. collected by Mr. Haseman at San Antonio de Rio Madeiro, Brazil. Its alimentary canal was gorged with blood.

The genera *Vandellia* and *Urinophilus* are members of the Pygidiidae, a family of the Nematognathi, the cat-fish-like fishes. In most of these the maxillary is reduced to a rudiment forming the base of the chief barbel of the catfish. In *Urinophilus* and *Vandellia* the maxillary bone carries peculiar claw-like teeth. In the monograph mentioned above the tooth-bearing maxillary was labelled "pre-maxillary" in the explanation of Figs. 35 A and B, and in Fig. 37.

C. H. EIGENMANN

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE SECTION H—ANTHROPOLOGY AND PSYCHOLOGY. II

Racial differences in mental fatigue: T. R. GARTH. An experiment was given to school children of three races—white, Indian and negro, involving a simple task which all could perform. The problem was to ascertain which race showed least falling away in a task of continuous performance. The young group worked for twenty-eight minutes and the older group for forty-two minutes. The Indians, as a group, excel the whites in endurance but not in total performance.

Supernormal memory: P. F. SWINDLE. Ordinarily, the term *hysteria* is a name applied to certain spectacular forms of behavior which arise quite suddenly and which consist of strong and very permanently associated responses. Such a form of behavior may be called a somnambulism, a fugue, a hysterical fit, or a special personality; and it is manifested only by those persons in whom associations are easily and at the same time quite permanently formed. If, in this sense, a person possesses an exceptionally good memory, a single unusual occurrence will probably suffice to establish in him a series of strong responses which will be manifested later as a somnambulism. It is profitable to speak of "big" somnambulisms and "little" somnambulisms, or spectacular somnambulisms and ordinary somnambulisms. Hysteria is

entirely a relative term. The terms *amnesia* and *dissociation of the personality*, which are so frequently used in speaking of hystericals, are misleading. Each of them should mean that if a person is occupied in one way, he is ordinarily not doing other things or thinking in other ways at that time. For example, only a few minutes ago I was occupied in thinking about a certain demonstration that a katydid can exert a force of at least thirty pounds with its ovipositor. While occupied in this way, I had complete amnesia for a dog I once owned; and at the time that I was thinking about my dog, I had complete amnesia for the experiment with the insect. My dog and the insect established in me two "little" somnambulisms; and I am never active in both ways at the same time. Likewise, a typical hysterical remembers his somnambulism only under the condition that he manifests it again; and when he the cases of typical hysteria which have come under my observation, many of the somnambulisms manifests it he has amnesia for other things. In or personalities were remarkably well associated. This circumstance makes it easy to produce artificially any of the existing states; and it is also responsible for the remarkable periodicity in the manifestations, by certain patients, of their established somnambulisms.

Definitions of mind offered by college students: C. R. GRIFFITH. The purpose of this investigation was (a) to obtain a definite expression of the nature of the beliefs and prejudices about "mind" which are held by common-sense, and (b), to point out some of the antecedents of these notions. Definitions of "mind" obtained in a naïve manner from students at the University of Illinois are suggestive of the beliefs of popular opinion at large, and indicate, as well, the degree in which the laymen lags behind the trend of scientific thought. A tabulation of the definitions under appropriate categories discloses the fact that popular opinion engages in little or no critical reflection upon the matter. Conceptions of mind as a power, force, energy, guide or faculty are frequent, as are also conceptions confusing mind with the brain, the nervous system, or some internal organ. Less frequent notions make use of such terms as "soul," "spirit," "personality" or "storehouse." Most of the definitions are, in fact, plainly reminiscent of the days of magic and of worn-out philosophies and discarded theories. Moreover, they represent in an undisguised way the wishes and desires of the men who value them. Over the whole is a thin sur-

facing of modern science. The opinions, thus formed, are garbled in the telling, and betray, for the most part, a notable want in critical ability as well as a lack of substantial knowledge.

Organization of course of study in the elementary school: HELEN T. WOOLLEY.

Contributions of experimental psychology to the psychology of the elementary school branches: C. T. GRAY.

Safety-first education in school: M. J. MAYO. The loss of life and property in the United States through avoidable accident has become well nigh a national reproach. There is a growing public sentiment against the continuance of this evil. Largely through the influence of the National Safety Council, industrial accidents have been materially reduced. This has been effected through two means: (1) the appliance of safety devices to machinery wherever possible; and (2) a campaign of safety education among workmen. What are known as public accidents, however, show no decline. In the home and on the streets and highways an increasing number of serious and fatal accidents occur. The toll among the school population is large. The teaching of accident prevention is now admittedly a school problem. No other kind of education can more completely justify itself. Public safety can be promoted through two means: (1) the elimination of all avoidable sources of danger; and (2) adequate safety education. Safety education consists of (1) a thorough knowledge of all common danger situations, (2) correct habits of behavior in their presence, and (3) high ideals and right attitudes in regard to safety. We must teach definitely under what circumstances explosives and poisons are dangerous, just how it is that accidental burns and falls occur, just what our habits of behavior on the streets should be. We must act consistently and habitually in accord with this knowledge. This behavior can be secured only through high ideals of the value of human life and limb and a positive attitude towards safety. Our ideals must be dynamic in character. Only, for instance, when we have created an active ideal among the boys—a sort of public sentiment—that condemns riding on the rear end of street cars as a piece of recklessness and stupidity, can this source of fatal accident be eliminated.

The distribution of grades in large lecture rooms: C. R. GRIFFITH. The distribution according to seating arrangement of the grades of students registered in large lecture classes discloses a variation that can not be attributed to differences in

mental ability or in physical well-being. For example, the grades of students who sit at the periphery of a group are appreciably lower than those of students who sit in the center. Again, grades at the rear of a room show greater variation than do those at the front. In general, the grades obtained by a given student are dependent partially upon such factors as his mental ability and physical condition, but partially also upon his position with reference to the rest of the group to which he belongs. The disadvantages arising from an unfavorable position in the group can not be wholly attributed to the size of the lecture-rooms, or to idiosyncrasies of the speaker. It is overcome, in part, during the course of the semester, and it may also be offset by the addition of frequent small sectional meetings; it is increased by such factors as intervening aisles and by unoccupied seats. The disadvantage has been found incidentally to rest upon variations in certain perceptual and attentional factors and upon differences in the type of self-instruction under which the individual works; but essentially to rest upon the varying degrees of social integration which are always present among the members of an assembled group.

Speech and brain patterns: L. W. COLE. Association experiments with nonsense syllables indicate that verbal recalls are due to the presence of brain patterns in which each syllable is under the influence of one branch of the pattern. The interweaving of these patterns accounts for the continued suggestion by similarity of one idea by another, or, in other words, it gives a neural basis for association by similarity. It also gives a reason for verbal lapses of memory in which there is recall of part of one word with part of another when the word sought for is partially forgotten. The theory is merely an extension of Sherrington's conception of reflex patterns and it would replace with a definite meaning such vague terms as "mode" of impression, retention and recall, which are used by many writers for the lack of a more definite term. Finally the experiments with nonsense syllables show that rhythm is the most persistent and permanent element of a verbal impression.

A learning curve starting at approximately zero: E. K. STRONG, JR. A boy of 5 years has been given two minutes drill on addition combinations a day for 150 days. At the start he knew nothing of additions except that one and one made two and that one and two made three and that he could

count orally to twenty-five. The learning curve obtained in this case does not follow the usual course but runs nearly parallel to the base line for many days and then rises with a positive acceleration. At the end of 158 days it had not suggested a change from positive to negative acceleration.

Methods of error elimination in a mental maze: T. PETERSON. The mental maze method attempts to study maze learning devoid of all the disturbing spatial factors characterizing the usual mazes. The experimenter has before him a picture of a circular maze, with the various parts lettered in a random order. Sitting behind a screen, he calls out to the subject pairs of letters representing bifurcations in the maze and the subject chooses without seeing the maze. Whether the correct letter is called first or last is a matter that is determined by chance. The subject is instructed to get to the goal with as few errors as possible, and is told the number of errors each time on reaching the goal, but he must find out for himself where the errors are. Subject is also timed. Results show backward elimination of errors of entrance to blinds, and relatively early elimination of return "runs," thus substantiating results obtained by the author on rats in different forms of mazes. The tendency to return to the starting place in the maze at first greatly exceeds that expected on the law of probability, but this tendency rapidly yields to that of keeping the forward direction. "Coefficients of learning" for the runs past the several blinds are worked out statistically, each coefficient representing the ratio of probable runs past to probable runs into the blind. These coefficients are found to increase toward the goal end of the maze, thus accounting for the backward elimination of errors; and the advantage for learning at the goal-end of the maze over the entrance-end is shown to be greater than in mazes with many than in those with few blinds. Moreover, this advantage is greater in the first trial than in subsequent trials by any subject; it decreases with successive trials, thus favoring more rapid learning in early trials. Statistical calculations as to the number of errors in each part of the maze on the expectations of chance laws, lead to the conclusion that, independently of the backward elimination tendency, learning progresses more rapidly, in proportion to exercise, in the first and in the last part of the maze than between the extremes.

The development and functioning of a concept in problem-solving: J. O. PETERSON. An objective study is made of the reactions of adults to a num-

ber of series of closely related novel problems. In the solution of successive problems of a series the essential common elements are gradually abstracted and associated with an appropriate symbol of some sort. There thus develops a general concept which functions increasingly in succeeding problems in directing observation and controlling re-formulation of hypotheses, until finally new problems are solved at sight or a general formula is given for all problems of the series. In the solution of successive series of problems further functioning and development of the concept occur, enabling the subject finally to generalize correctly in advance for new series of problems of the same type. The order of abstraction of essential situation-elements was found to follow closely the order of frequency of the subject's reactions to them. This is also the order of their temporal nearness to the goal or end of the trial. The recombination of essential elements in connection with appropriate symbols, and their association with effective responses, follow the same order though somewhat less closely. There was usually a high degree of transfer of the effects of learning from problem to problem and from series to series of problems. The median percentage of transfer from the first to the second series was almost invariably surpassed by subjects who required more than the median number of trials for the mastery of the first series. This high degree of transfer in the work of slow learners appears to have arisen from the greater strength of mechanical associations rather than from a deeper insight into the causal relations involved. However, the basic concept mentioned above appears to have been the principal medium of transfer. Yet it should not be forgotten that this concept functioned through specific associations which had become mechanized to a high degree largely through repetition.

EDWARD K. STRONG, JR.,
Secretary

GENERAL MEETING OF THE AMERICAN CHEMICAL SOCIETY

THE 59th meeting of the American Chemical Society was held at St. Louis, Mo., April 12 to Friday, April 16, 1920. The council meeting was held on the 12th, a general meeting on April 13th, both in the morning and in the afternoon, divisional meetings all day Wednesday and Thursday morning, and excursions, Thursday afternoon and Friday. Full details of the meeting and program will

be found in the May issue of the *Journal of Industrial and Engineering Chemistry*. The registration was slightly over one thousand, eight hundred and twenty-five enjoying the smoker.

General public addresses were given by Paul W. Brown, editor and publisher of "America at Work," on "The Physical Basis for the Economical Development of the Mississippi Valley," by Chas. H. Herty on "Victory and its Responsibilities." The chief public address was given in the assembly room at the Central High School on "Chemical Warfare" by Col. Amos A. Fries, director of the Chemical Warfare Service.

The following Divisions and Sections met: Agricultural and Food, Biological, Industrial Chemists and Chemical Engineers, Organic, Pharmaceutical, Physical and Inorganic, rubber, and water, Sewage and Sanitation Divisions and the Dye, Leather, and Sugar Sections. Further details of their meetings will be found in the May issue of the *Journal of Industrial and Engineering Chemistry*.

The banquet, held on Thursday evening, April 15, filled the large banquet hall of the Hotel Statler.

A general business meeting was held on Tuesday morning, at which resolutions published in the Council Proceedings, this issue, on the death of Professor Alfred Werner were read by Dr. Chas. H. Herty. Also, Ernest Solvay was unanimously elected an honorary member of the American Chemical Society.

CHAS. L. PARSONS,
Secretary

SCIENCE

A Weekly Journal devoted to the Advancement of Science, publishing the official notices and proceedings of the American Association for the Advancement of Science

Published every Friday by

THE SCIENCE PRESS

LANCASTER, PA.

GARRISON, N. Y.

NEW YORK, N. Y.

Entered in the post-office at Lancaster, Pa., as second class matter